ZOOLOGICAL SCIENCE 10: 147-154 (1993)

Two New Species of the Genus *Staphylocystis* (Cestoda: Hymenolepididae) from the House Shrew, *Suncus murinus*, in Nepal

ISAMU SAWADA[1], KAZUHIRO KOYASU[2] and KRISHNA CHANDRA SHRESTHA[3]

[1]*Biological Laboratory, Nara Sangyo University, Sango, Nara 636,*
[2]*the Second Department of Anatomy, School of Dentistry, Aichi-Gakuin University, 1-100 Kusumoto-cho, Chikusa-ku, Nagoya 464, Japan and* [3]*Department of Zoology, Pri-Chandra Campus, Kathmandu, Nepal*

ABSTRACT—Two new species of the cestode parasite, *Staphylocystis* (*Staphylocystis*) *kathmanduensis* sp. nov. and *S.* (*S.*) *trisuliensis* sp. nov. are described from the house shrews, *Suncus murinus* of Kathmandu and Trisuli, respectively. The former is related to, but different from *S.* (*S.*) *delicata* Sawada et Koyasu, 1991 in the length and number of the rostellar hooks, and the size of the rostellum. The latter is related to, but different from *S.* (*S.*) *dsinezumi* Sawada et Koyasu, 1990 in the rostellar hooks. The house shrew, *Suncus murinus*, one kind of the commensal mammals, are widly distributed in Asia and are found infected with a great number of different cestodes. The difference between the two cestode species infecting *Suncus murinus* collected respectively at Kathamandu and Trisuli is discussed according to the hosts's behavior patterns.

INTRODUCTION

The cestode parasites of the house shrew, *Suncus murinus*, in Nepal are little known except the one reported by Sawada and Koyasu [11], who described a new species, *Pseudhymenolepis nepalensis* from *Suncus murinus* collected at Kathmandu. Since then, no attempts have been made to study the cestode parasites of *Suncus murinus*, although it is quite commonly found in Nepal. This paper reports anothor two new hymenolepidid cestodes obtained from *Suncus murinus* collected at Kathmandu and Trisuli, and discusses the difference between the two new species from the point of view of the host's behavior patterns [1, 3].

MATERIALS AND METHODS

Seven specimens of *Suncus murinus* were collected with traps at Kathmandu and Trisuli in March, 1991, and were examined for cestodes in connection with the previous investigation (Fig. 1). The shrews were autopsied immediately after capture, and their guts were removed and fixed in Carnoy's fluid, and maintained until the investigation in Japan. The methods used have been described in the previous paper [10]. All measurements are given in millimeters unless otherwise stated.

Accepted September 5, 1992
Received March 30, 1992

Staphylocystis (*Staphylocystis*) *kathmanduensis* sp. nov. (Fig. 2–6)

From March 17 to 31, 1991, four house shrews, *Suncun murinus*, were captured at Kathmandu. One of them harbored five mature specimens of this cestode.

Description (based on five specimens): Small-sized hymenolepidid; mature worm length 7.1–8.3 and maximum width 0.8–0.9. Metamerism distinct; margin slightly serrate. Scolex round, 0.221–

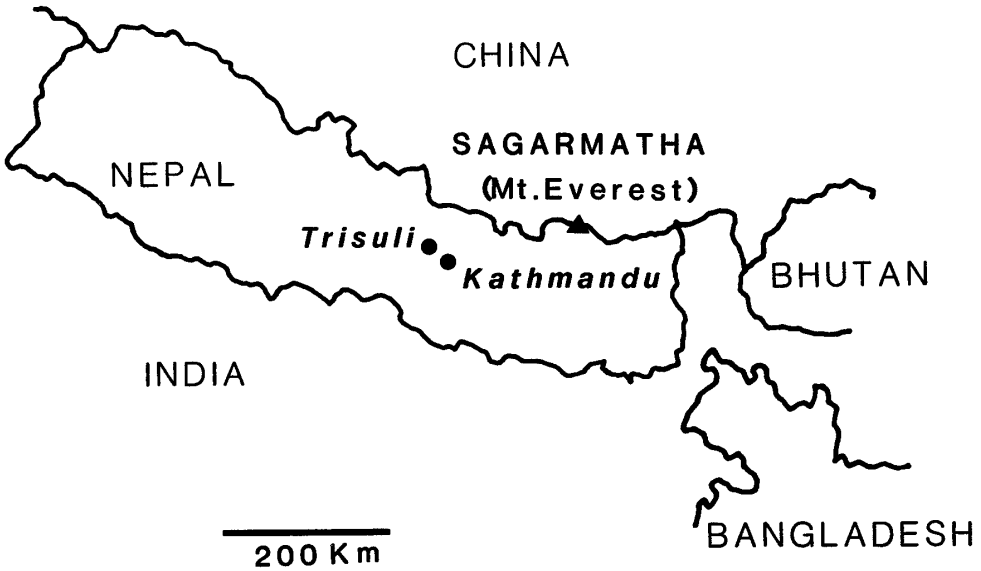
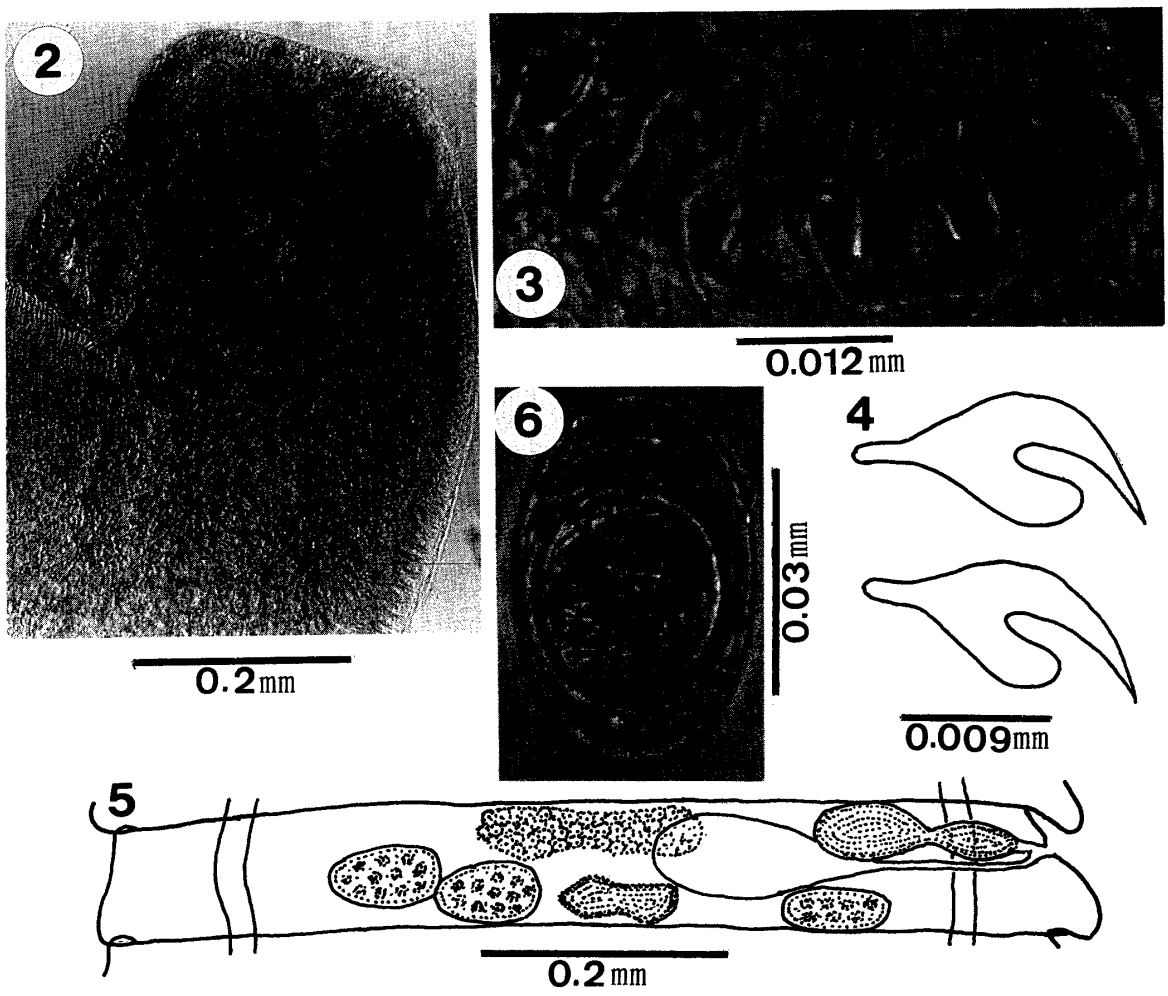


FIG. 1. Map of Nepal showing the localities of the house shrews collected.



FIGS. 2–6. *Staphylocystis* (*Staphylocystis*) *kathmanduensis* sp. nov. 6: Egg.
2: Scolex. 3: Rostellar hooks. 4: Rostellar hooks magnified. 5: Mature segment drawn from a projected microphotographic negative, dorsal view. 6: Egg.

0.235 in length by 0.290–0.456 in width. Rostellum pyriform, 0.056 long by 0.070 wide, armed with a single row of 13 thorn-shaped hooks 0.018 long. Hook handle short; guard bluntly round at its end, shorter than blade; blade slender, sharp at its end, curved toward guard. Rostellar sac slightly elongated, 0.161–0.189 long by 0.119–0.126 wide, extending past posterior margin of suckers. Suckers discoid, 0.111 in diameter.

Genital pores unilateral, situated a little anterior to middle of segment margin. Testes three in number, oval, 0.070–0.084 long by 0.028–0.035 wide, arranged in a transverse row, one poral and two aporal. Cirrus sac pryiform, 0.105–0.126 long by 0.035–0.042 wide, extending beyond longitudinal excretory canals. Internal seminal vesicle 0.049–0.056 long by 0.028–0.035 wide, occupying almost whole of cirrus sac. External seminal vesicle 0.070 long by 0.021–0.028 wide. Ovary transversely elongate, bilobate, 0.105–0.140 wide. Seminal receptacle large, dorsal to ovary, 0.112–0.140 long by 0.035–0.042 wide. Vitelline gland bilobate, 0.049–0.070 long by 0.028–0.035 wide. Eggs elliptical, 0.049–0.053 in major axis and 0.032 in minor axis. Embryophore 0.032 by 0.028. Onchospheres spherical, 0.028 in diameter; embryonic hooks 0.014 long.

Host: *Suncus murinus* (Insectivora: Soricidae).

Habitat: Small intestine.

Locality and date: Kathmandu, Nepal; March 31, 1991.

Type specimens: Holotype, Nara Sangyo Univ. Lab. Coll. No. 9300; paratypes, 9301–9302.

Remarks: About 22 species of *Staphylocystis* (*Staphylocystis*) have been recorded from the Soricidae [9, 10, 12, 13]. Of these, the species armed with 10–15 rostellar hooks ranging in length from 0.015 to 0.021 are: *S.* (*S.*) *minutissima* (Meggitt, 1927) Yamaguti, 1959 [4]; *S.* (*S.*) *pauciproglottis* (Neiland, 1953) Yamaguti, 1959 [6]; *S.* (*S.*) *suncusensis* Olsen et Kuntz, 1978 [8]; *S.* (*S.*) *curiosihamata* Sawada et Koyasu, 1990 [10]; *S.* (*S.*) *naganoensis* Sawada et Koyasu, 1990 [10]; and *S.* (*S.*) *delicata* Sawada et Koyasu, 1991 [12]. The present new species most closely resembles *S.* (*S.*) *delicata* in the shape of the rostellar hooks. However, the species is distinguished from *S.* (*S.*) *delicata* by the larger number (13 against 10) and longer size (0.018 against 0.014) of the rostellar hooks, and the larger rostellum (0.056 by 0.070 against 0.028 by 0.035).

Staphylocystis (*Staphylocystis*) *trisuliensis* sp. nov. (Fig. 7–12)

On March 20 and 21, 1991, three house shrews, *Suncus murinus,* were captured at Trisuli. All of them were found infected with one or two mature cestodes.

Description (based on four specimens): Small-sized hymenolepidid; mature worm 9.2–10.3 long by 0.8–0.9 wide. Mature segment serrate and wider than long. Scolex 0.140–0.175 long by 0.266–0.280 wide, sharply demarcated from neck. Rostellum oval, 0.056–0.070 long by 0.070–0.091 wide, armed with a single row of 21–22 chelate-shaped hooks 0.018 long. Hook handle comparatively long; blade long, slender and pointed; guard shorter than blade and thick. Rostellar sac oval, 0.126–0.161 long by 0.070–0.140 wide. Suckers discoid, 0.119–0.026 in diameter.

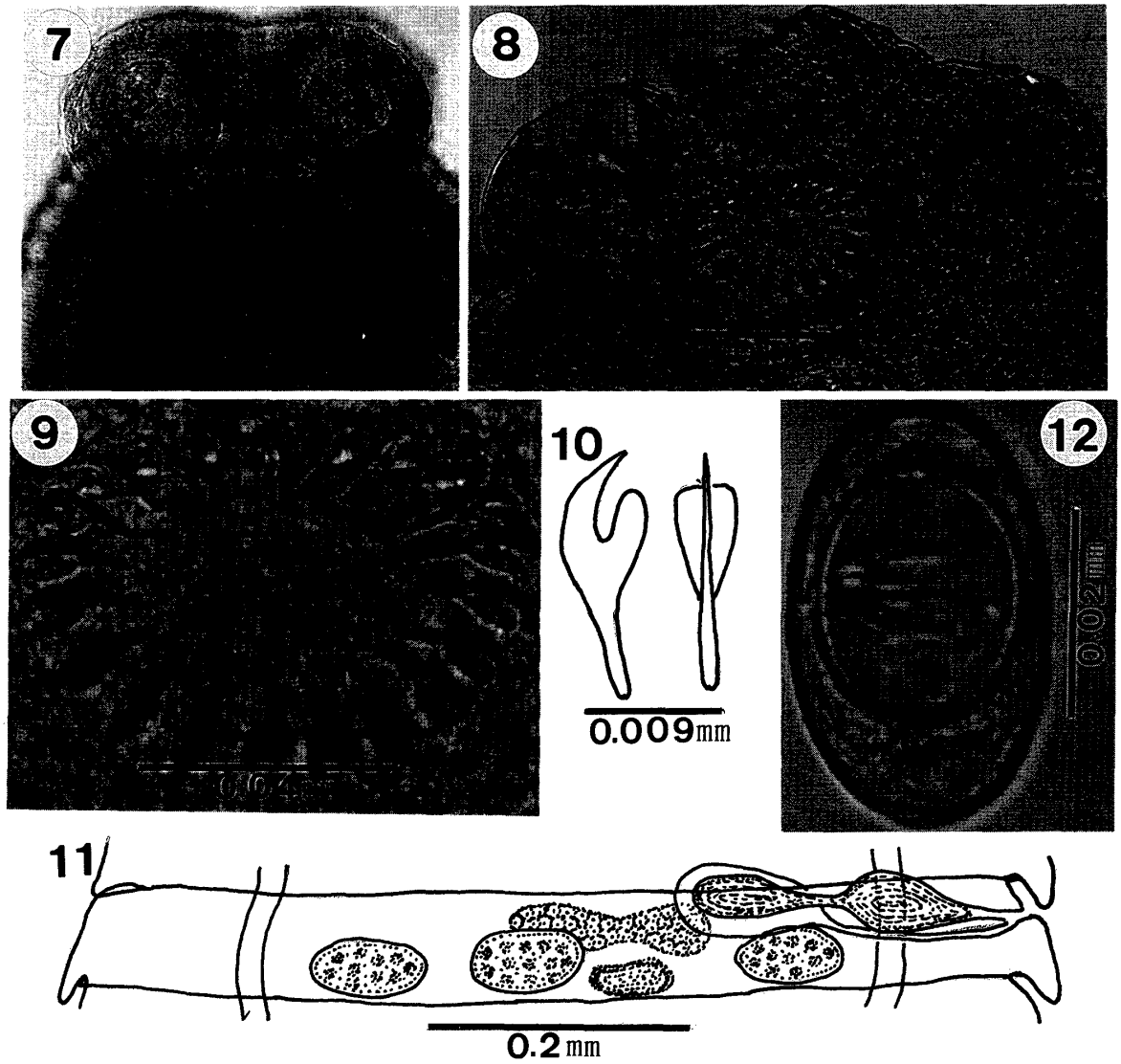
Genital pores unilateral, located a little anterior to middle of segment margin. Testes three in number, oval, 0.098–0.105 long by 0.035–0.049 wide, arranged in a transverse row, one poral and two aporal. Cirrus sac pyriform, 0.126–0.140 long by 0.042 wide, extending beyond longitudinal excretory canals. Internal seminal vesicle 0.091–0.105 long by 0.035–0.042 wide, occupying almost whole of cirrus sac. External seminal vesicle 0.105–0.126 long by 0.042–0.049 wide. Ovary transversely elongated, bilobate, 0.154–0.175 wide. Voluminous seminal receptacle measuring 0.119–0.140 long by 0.070–0.098 wide. Vitelline gland irregularly lobate, situated in posterior field of segment, 0.070–0.091 long by 0.035–0.042 wide. Eggs elliptical, 0.039–0.042 in major axis and 0.028–0.032 in minor axis, with at each pole a round projection provided with polar filaments. Onchospheres spherical, 0.025 in diameter; embryonic hooks 0.011–0.014 long.

Host: *Suncus murinus* (Insectivora; Soricidae).

Habitat: Small intestine.

Locality and date: Trisuli, Nepal; March 20 and 21, 1991.

Type specimens: Holotype, Nara Sangyo Univ.



FIGS. 7–12. *Staphylocystis* (*Staphylocystis*) *trisuliensis* sp. nov.
7: Scolex 8: Scolex magnified. 9: Rostellar hooks. 10: Rostellar hooks magnified. 11: Mature segment drawn from a projective microphotographic negative, dorsal view. 12: Egg.

TABLE 1. A comparison of related species of *Staphylocystis* (*Staphylocystis*) armed with 18–24 rostellar hooks ranging in length from 0.020 to 0.029 mm from the Insectivora

Species	Rostellar hooks		Host
	number	length (mm)	
1. *S.* (*S.*) *chrysochloridis* [2]	16–18	0.029	*Chrysochloria capensis* *Ch. aurea*
2. *S.* (*S.*) *furcata* [14]	22–28	0.026–0.028	*Sorex araneus* *Suncus murinus* *Neomys fodiens*
3. *S.* (*S.*) *dsinezumi* [10]	23	0.020	*Crocidura dsinezumi*
4. *S.* (*S.*) *sindensis* [5]	20	0.022–0.023	*Suncus murinus sindensis*

Lab. Coll. No. 9303; paratypes, 9304–9309.

Remarks: Out of the 22 known species of *Staphylocystis* (*Staphylocystis*) from the Soricidae [9, 10, 12, 13], four; *S.* (*S.*) *chrysocholoridis* (Janicki, 1904) Spassky, 1950 [2], *S.* (*S.*) *furcata* (Stieda, 1862) Spassky, 1950 [14], *S.* (*S.*) *sindensis* Nama, 1976 [5] and *S.* (*S.*) *dsinezumi* Sawada et Koyasu, 1990 [10] are armed with 18–24 rostellar

TABLE 2. *Suncus* spp. and their cestode parasites in Asia ([1, 7, 13], the present study)

Locality	*Suncus* spp.	Cestode parasites
Japan		
Kyushu	*Suncus murinus temmincki*	*
Okinawa	〃	*Vampirolepis jakounezumi* Sawada et Hasegawa, 1991
		V. okinawaensis Sawada et Hasegawa, 1991
		V. grascilistrobila Sawada et Harada, 1989
		Staphylocystis (*Staphylocystis*) *suncusensis* Olsen et Kuntz, 1978
		Rodentolepis sp. Uchikawa, Sakumoto et Kinjo, 1981
Taiwan		
Taoyuan Hsien	*S. murinus swinhoei*	*V. sunci* Sawada et Harada, 1989
		V. gracilistrobila Sawada et Harada, 1989
		V. sessilihamata Sawada et Harada, 1989
Nantou Hsien	〃	*S.* (*S.*) *suncusensis* Olsen et Kuntz, 1978
Ping Toung County	〃	*S.* (*S.*) *delicata* Sawada et Koyasu, 1991
		S. (*S.*) *furcata* (Stieda, 1862) Spassky, 1950
		V. microscolex Sawada et Koyasu, 1991
China		
Southern China	*S. murinus*	*
Hainan Dao	〃	*
Vietnam		
Saigon-Cholon	*S. murinus*	*
Nha Trang	〃	*
Con Son Island	〃	*
Bangladesh		
Mymensingh	*S. murinus*	*
Thailand		
Chanthaburi	*S. murinus*	*V. nana* (Siebold, 1852) Spassky, 1954
		Raillietina (*Raillietina*) *madagascariensis* (Davaine, 1869) Fuhrmann, 1920
Pakistan		Syn. *R.* (*R.*) *siriraji* Chandler et Pradatsundarasar, 1957
	S. murinus tytleri	*
	S. murinus sindensis	*V. jacobsoni* (Linstow, 1907) Schmidt, 1986
Karachi	〃	*Hymenolepis mujibi* Bilqees et Malik, 1974
	S. etruscus	*
	S. stoliczkanus	*
Myanmer		
Rangoon	*S. murinus*	*S.* (*S.*) *minutissima* (Meggitt, 1927) Yamaguti, 1959
		S. (*S.*) *furcata* (Stieda, 1862) Spassky, 1954
		S. (*S.*) *solitaria* (Meggitt, 1927) Yamaguti, 1959

Afghanistan		
Jalalabad, Laghman	*S. murinus*	*V. jacobsoni* (Linstow, 1907) Schmidt, 1986
		Hymenolepis sunci Vaucher et Tenora, 1971
Singapore		
	S. murinus	*
	S. etruscus malayanus	*
Malaysia		
Sabah Province	*S. murinus*	*
Sarawak	*S. hosei*	*
Indonesia		
Kalimantan	*S. etruscus*	*
	S. ater	*
	S. murinus	*
Java Island	*S. murinus*	*V. jacobsoni* (Linstow, 1907) Schmidt, 1986
Flores Island	*S. mertensi*	*
India		
Sanchore	*S. murinus sindensis*	*S.* (*S.*) *sanchorensis* Nama et Kichi, 1975
Jadhpur	*S. murinus sindensis*	*S.* (*S.*) *sindensis* Nama, 1979
		V. bhali (Singh, 1958) Schmidt, 1986
Allahabad	*S. murinus*	*V. molus* Srivastava et Capoor, 1979
		V. allahabadensis Srivastava et Pandey, 1982
	S. murinus	*S.* (*S.*) *indicus* Nanda et Malhotra, 1990
Bombay	*S. murinus*	*V. jacobsoni* (Linstow, 1907) Schmidt, 1986
Khrhja	〃	*Pseudhymenolepis guptai* Gupta et Singh, 1987
Lucknow	*S. striatus*	*Pseudhymenolepis suncusi* Gupta et Sinha, 1984
South India	*S. dayi*	*
	S. stoliczkanus	*
Sri Lanka		
Horton Plains	*S. murinus montanus*	*V. montana* Crusz et Sanmugasunderam, 1971
		Pseudhymenolepis eisenbergi Crusz et Sanmugasunderam, 1971
	S. etruscus	*
Nepal		
Kathmandu	*S. murinus*	*Pseudhymenolepis nepalensis* Sawada et Koyasu, 1991
		S. (*S.*) *kathmanduensis* sp. nov.
	S. etruscus	*
Adhabar	*S. stoliczkanus*	*
Trisuli	*S. murinus*	*S.* (*S.*) *trisuliensis* sp. nov.
Philippines		
Palawan Island	*S. murinus*	*
	S. occultidenus	*
	S. palawanensis	*
Luzon Island	*S. luzoniensis*	*
Northern Marianas		
Guam Island	*S. murinus*	*

* Unknown

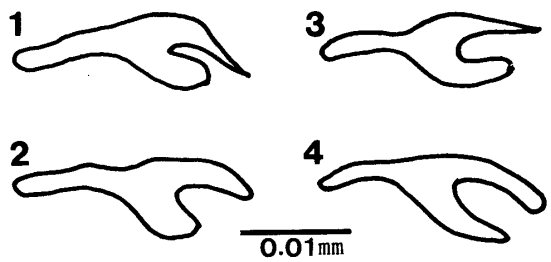


FIG. 13. Comparison of rostellar hook in shape among four related species.
1: *S.* (*S.*) *chrysochloridis* [2] 2: *S.* (*S.*) *furcata* [14] 3: *S.* (*S.*) *dsinezumi* [10] 4: *S.* (*S.*) *sindensis* [5]

hooks ranging in length from 0.015 to 0.025 (Table 1). The present new species most closely resembles *S.* (*S.*) *dsinezumi* in the number and length of the rostellar hooks. However, the shape of the rostellar hooks separates this new species from *S.* (*S.*) *dsinezumi* (Fig. 13).

DISCUSSION

There are quite a number of different cestodes infecting *Suncus murinus* in Asia (Table 2) ([1, 7, 13], the present study). The following is thought to be one of the reasons. Because the behavior patterns of predation displayed by *Suncus murinus* are similar to those of commensal mammals, *Rattus norvegicus* and *Mus musculus* [1, 3], their eating habits are thought to overlap with each other resulting probably in a diversity in the intermediate hosts of the cestodes infecting it. So, varying with the area where *Suncus murinus* lives, the species of cestodes infecting it differ as much.

Even though the areas of Kathmaudu and Trisuli are separated by less than 30 km, the species of tapeworms differ. *Suncus murinus* cannot take low temperature (below 0°C) and the winter in Kathmandu (1350 m) is extremely harsh. The harsh coldness of winter causes their population crash, thus greatly decreasing the number of individuals which can, after surviving the cold season, bear offspring. Nonetheless, when May comes round, they come to appear in various places. This fact suggests, in order to recover the population crash, they represent annually a presence of dramatic fluctuation among the individuals which have survived the winter season. Between the Indian Plains and Kathmandu, and Kathumandu and Trisuli there are ranges of 2000 m plus mountains, so it cannot be presumed that *Suncus murinus* migrates between the three areas (Fig. 14), but in the past there have been numerous cases in which *Suncus murinus* was introduced to each of the areas, so many hereditary changes can be recognized. Evidence for this can be seen in the fact that *Pseudhymenolepis nepalensis* Sawada et Koyasu, 1990 were found infecting *Suncus murinus* in Kathmandu but not those in Trisuli.

Suncus murinus can be found in Kathmandu and Trisuli, wherever there are human dwelling and people often feed them. Looking at this type of

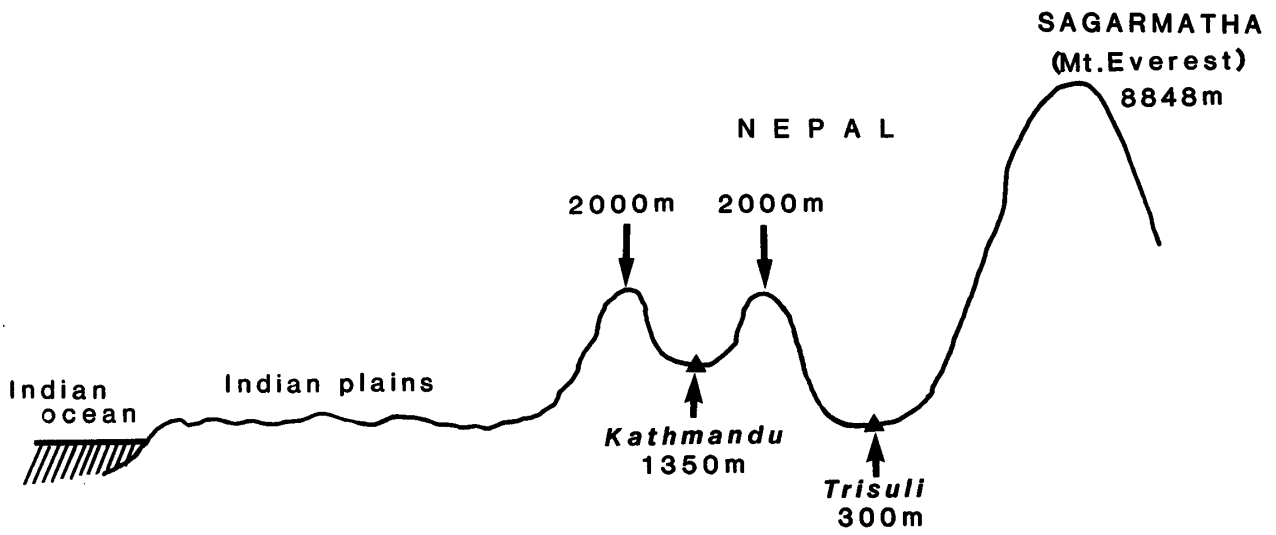


FIG. 14. Topographical map showing the heights above sea level of Kathmandu and Trisuli.

environment, over many years *Suncus murinus* of both areas have formed characteristic population, and since the type of intermediate hosts for cestodes in both areas is fixed, it can be seen that species of cestodes infecting *Suncus murinus* in the two areas differ from each other.

ACKNOWLEDGMENTS

We hereby wish to acknowledge our indebtedness to Mr. A. M. Vaidya, Pension SAKURA, Kathmandu, Nepal, for kind help in collecting shrews.

REFERENCES

1 Corbet GB, Hill JE (1991) A world list of mammalian species. 3rd Nat Hist Mus Publ and Oxford Univ Pres, London and Oxford, pp 243

2 Janicki C (1904) Zur Kenntnis einiger Säugetiercestoden. Zool Anz 27: 770–782

3 Marshall JD, Quy DV, Gibson FL, Dung TC, Cavanaugh DC (1967) Ecology of plague in Vietnam. 1. Role of *Suncus murinus*. Proc Soc Exp Biol 124: 1083–1086

4 Meggitt FJ (1927) On cestodes collected in Burma. Parasitology 19: 141–153

5 Nama HS (1976) On a new species of *Staphylocystis* Villot, 1877 (Cestoda: Hymenolepididae) from *Sunucus murinus sindensis*. Acta Prasitol Pol 24: 19–22

6 Neiland KA (1953) Helminths of Northwestern mammals. Part V Observations on cestodes of shrews with the descriptions of new species of *Liga* Weinland, 1857, and *Hymenolepis* Weinland, 1858. J Parasitol 39: 487–494

7 Ohbayashi M (1985) Helminth parasites of the Soricidae. In "*SUNCUS MURINUS*". Ed by S Oda J Kitoh, K Ohta, G. Isomura Jpn Sci Soc Press, Tokyo, pp 88–93

8 Olsen OW, Kuntz RE (1978) *Staphylocystis* (*Staphylocystis*) *suncusensis* sp. n. (Cestoda: Hymenolepididae) from the musk shrew, *Suncus murinus* (Soricidae) from Taiwan, with a key to the known species of *Staphylocystis* Villot, 1877. Proc Helminthol Soc Wash 45: 182–189

9 Sawada I, Harada M (1990) Cestodes of field micromammalians (Insectivora) from Central Honshu, Japan. Zool Sci 7: 467–475

10 Sawada I, Koyasu K (1990) Further studies on cestodes from Japanese shrews. Bull Nara Sangyo Univ 6: 187–202

11 Sawada I, Koyasu K (1991) *Pseudhymenolepis nepalensis* sp. nov. (Cestoda: Hymenolepididae) parasitic on the house shrew, *Suncus murinus* (Soricidae), from Nepal. Zool Sci 8: 575–578

12 Sawada I, Koyasu K (1991) Further studies on cestode parasites of Taiwanese shrews. Bull Nara Sangyo Univ 7: 131–142

13 Schmidt GD (1986) Handbook of tapeworm identification. CRC Press, Inc., Florida, pp 675

14 Stieda L (1862) Ein Beitrag zur Kenntnis der Taenien. Arch Naturg 28: 208–209